

Callistemon purpurascens (Myrtaceae): a new and threatened species from the Blue Mountains region of New South Wales, Australia

Steven M Douglas^{1,2,4} and Peter G Wilson³

¹Ecological Surveys & Planning, Bundanoon, NSW 2578, Australia

²School of Philosophical, Historical & International Studies, Monash University, VIC 3800, Australia

³National Herbarium of New South Wales, Royal Botanic Gardens and Domain Trust, Mrs Macquaries Road, Sydney, NSW 2000, Australia

⁴Author for correspondence: manager@ecologicalsurveys.net

Abstract

Callistemon purpurascens S.M.Douglas & S.David is described from the Blue Mountains region in Central Tablelands Botanical Division of New South Wales, Australia. The conservation status of this taxon is considered, with the conclusion being that it should be considered for listing as Critically Endangered under both state and Commonwealth legislation.

Introduction

Callistemon purpurascens is herein described as a new and apparently critically endangered species endemic to a very small area below the Blue Mountains Plateau of the Central Tablelands of New South Wales. The species was first collected in 2006 whilst undertaking a detailed assessment of the conservation status of *Callistemon megalongensis* (Craven & S.M.Douglas) Udovicic & R.D.Spencer (Douglas and Robyn 2006). Both species are believed to be endemic to the Megalong Creek catchment within the Megalong Valley, west and below the townships of Blackheath and Katoomba (Douglas and Robyn 2006; Douglas 2013). The former was initially listed as Vulnerable, but has since been recognised as Critically Endangered (NSW Scientific Committee 2013). The latter, which has been nominated for the same status, is currently known to have a population of <150 adults and is not known from any conservation estate. Sylvia R. David (previously known as Sylvia Robyn) located the first specimen of this plant during fieldwork for *C. megalongensis*, and recognised it as distinct from that species and *C. citrinus* (Curtis) Skeels.

Callistemon purpurascens is morphologically distinct and appears to be reproductively isolated from the other local species. It is very rarely sympatric with *C. megalongensis*, which occurs at only one of its two known locations, and in very low numbers, but is often sympatric with *C. citrinus*. *Callistemon megalongensis* and *C. citrinus* sometimes occur in very close proximity, although the majority of *C. megalongensis* plants occur in the absence of *C. citrinus*. No evidence of intergradation between these three proximate *Callistemon* species has been observed.

Taxonomic treatment

Callistemon purpurascens S.M.Douglas & S.David, sp. nov.

Diagnosis: *Callistemon purpurascens* is distinguished from *C. megalongensis* by having inflorescences 40–55 mm in diam. with purple flowers (cf. 30–40 mm and pink flowers), leaves 5–11 mm wide with a non-pungent mucronate tip (cf. 3.5–5 mm wide and pungent tip) and fruits 8–10 mm diam. (cf. c. 6 mm).

Holotype: New South Wales: Central Tablelands, unnamed tributary of Megalong Creek north of Nellies Glen Road, eastern Megalong Valley, S.M. Douglas & S. Robyn s.n., 15 Dec 2010 (NSW907108).

Shrub to 3–7 m high (mostly c. 3.5 m), tending to branch above 1.5 m; bark slightly fissured, platy and flaking to peeling (in small sections), subpapery on the largest stems and trunks. Branchlets glabrescent to sericeous. Leaves alternate, 30–70 mm long, 5–8 mm wide, oblanceolate, and thickened at the margin and midrib; both surfaces usually glabrous, but lower surface with occasional silky brown hairs towards the petiole. Leaf base finely tapered, thickened and often twisted. Leaf apex narrowly acute to narrowly acuminate, with a distinct mucro. Lateral leaf venation clearly pinnate, though generally less apparent than in *C. citrinus* due to the thicker leaves of *C. purpurascens*. Leaf oil glands less dense and less prominent than in *C. citrinus* and *C. megalongensis*, again due to the thickened lamina in *C. purpurascens*. Inflorescence spicate, pseudoterminal, with 20–60 monads, 60–120 mm long, 40–48 mm wide. Hypanthium tuberculate to warty-bullate, downy-hairy, 3.3–4.0 mm deep. Calyx lobes sparsely hairy (not glabrescent as in *C. megalongensis*), scarious with membranous bands; central band 0.1 mm wide. Stamens free, 45–50 per flower. Filaments red-purple (72A RHS Colour Chart, 1966), 17–23 mm long. Anthers dark purple to brown. Style 18–23 mm. Fruit c. 8–10 mm wide, sometimes slightly wrinkled, calyx lobes not retained; globose but may deform to barrel-shaped when crowded. Embryo with obvolvate cotyledons.

Other specimens examined: NEW SOUTH WALES: Central Tablelands: tributary of Megalong Creek north of Nellies Glen Road, eastern Megalong Valley, S.M. Douglas & S. Robyn s.n., 15 Dec 2010 (NSW907112, NSW907119, NSW907123); Back Creek, Megalong Valley, off Nellies Glen Road, B. Collins 6, 17 Mar 2010 (CANB789014).

Distribution: only known from the swampy riparian zone of two unnamed tributaries of Megalong Creek below the Blue Mountains Plateau, New South Wales, Australia. The reference to Back Creek (Collins 6 and associated collections) is incorrect.

Phenology: main flowering period occurs in December.

Habitat: swampy, mostly riparian shrubland, swamp woodland and swamp forest with emergent *Melaleuca linariifolia*, *M. styphelioides* and *Eucalyptus camphora*; *Leptospermum* species are often dominant in the midstorey. The ground stratum is variable depending on moisture levels, light levels, and disturbance history (domestic and feral livestock), and can include aquatic and semi-aquatic species along with significant numbers of *Spiranthes* and *Drosera* at some sites. The sedge, *Carex appressa*, and the rush, *Lomandra longifolia* can be common. Adjoining vegetation is, or apparently was (prior to clearing), woodland to open forest with canopy species of *Eucalyptus sclerophylla* and *E. mannifera* subsp. *gullickii*, and forest of *E. amplifolia* and *E. viminalis*. Country rock is of the Permian Illawarra Group, though soils are apparently of Quaternary alluvium, kept moist by surface water, and likely by some component of groundwater. Rock outcrop is absent in the habitat but can be prevalent in adjoining areas in the form of sandstone.

Conservation status: the conservation status of *C. purpurascens* has been assessed by S.M. Douglas as ‘critically endangered’ under the terms of the Commonwealth Environment Protection Biodiversity Conservation (EPBC) Act 1999, and the New South Wales Threatened Species Conservation Act 1995.

Callistemon purpurascens is known only from privately owned rural / rural-residential allotments, with a small part of the population within a large portion of former Crown land now owned by an Aboriginal Land Council. Parts of the habitat appear to have been partially cleared in the 1970s or 1980s, probably for grazing. Substantial earth-wall dams have been constructed above and below areas of core habitat on both of the tributaries in which the species is known to occur. The effects of these are unknown, though the species appears to have colonised some of the disturbed areas. Parts of the rural properties on which the species occurs have been subject to ‘pasture improvement’ in the form of introduced lawn and pasture grasses, especially *Axonopus affinis* (carpet grass). This grass occupies large areas of the drier and moderately moist habitat surrounding *C. purpurascens*, but tends not to intrude into core habitat. It may, however, suppress germination of *Callistemon* species by forming a dense mat, though *Leptospermum* species are colonising areas in which carpet grass is dominant. This may result in the grass being shaded-out, such that other species, including *Callistemon* spp., can then recruit into areas with less competition from the otherwise dense grass mat.

Repeated surveys of the known and likely proximate habitat indicate that the total population of adult *C. purpurascens* is <150, however a survey in late 2010 in post-drought conditions indicated that substantial recruitment may have occurred. Since that time, some favourable conditions have occurred but have been followed by drought. Douglas (2013) and others undertook surveys during significant rains after an exceptionally warm and dry winter, but did not find evidence of significant recruitment, though seedlings of the three Callistemons present in this area are not readily distinguished from each other, and whilst subadult plants of *C. megalongensis* can generally be distinguished from the other two species, this is not as feasible, at least in the field, between *C. citrinus* and *C. purpurascens*.

Flowering and fruiting occurs at 5 to 7 years of age. Survival rates of germinants and seedlings are unknown, though areas in which recruitment was observed were often relatively dense scrub dominated by *Leptospermum* species. Competition for suitable habitat appears to be intense, and the species may rely on disturbance events such as wind-throw of canopy trees and shrubs, or fire, to facilitate major recruitment that results in the establishment of additional adult plants.

Douglas (2013) located the species in a second tributary to the east of the type location, and whilst recruitment of *C. citrinus* and *C. megalongensis* was evident, there was no clear evidence of recruitment of *C. purpurascens*. Much of the habitat between the two dams within this tributary was severely disturbed by pigs and was relatively open. It appeared that the frequency and severity of ground disturbance was likely to prevent seedlings from surviving in the most affected areas.

Most specimens of *C. purpurascens* are mature to late-mature, though a younger cohort of perhaps several years of age was noted in some areas on the edge of the upper swamp habitat at the more westerly location. The youngest cohort was scattered around the swamp margins in prime and suboptimal habitats. The edges of the habitat have previously been cleared, and are now dominated by *Leptospermum* regrowth, within which there are substantial numbers of *C. citrinus* (Douglas and Robyn 2006; Douglas 2013).

Threats to the survival of *C. purpurascens* include: extremely small area of occupancy; extremely small population size; absence of the species from any conservation estate; weed invasion (*Rubus anglocandicans* is the primary concern, though pasture weeds are also an issue, and *Lonicera japonica* is a problem nearby); livestock grazing (this is non-commercial and low intensity but results in pugging and increased erosion of the swampy soils, and facilitation of weed invasion); habitat degradation and altered hydrology due to pig wallowing; risk of further habitat clearing associated with rural-residential land use and bushfire risk management; forecast effects of climate change including possible erosion of the swampy floodplain in extreme rainfall/flood events, and possible loss or degradation of habitat due to prolonged and severe droughts (see, for example, Steffen *et al.* 2009).

Etymology: the specific epithet derives from the purple colour of the inflorescence.

Notes: *Callistemon purpurascens* is readily distinguished from *C. megalongensis*, especially if both are in flower: the former has large, purple flowers that fade to dull red (Fig. 1), and the latter has narrower, light pink flowers (though these are initially darker and fade to light pink at maturity). Leaf shape readily separates these species, with *C. megalongensis* having a much narrower leaf with a pronounced and pungent mucro (Fig. 4). The mature fruit of *C. purpurascens* are noticeably larger (up to 10mm wide) than those of *C. megalongensis* and *C. citrinus* (Figs 3, 4). Collins (CANB, in sched.) notes that *C. purpurascens* (recorded as *Melaleuca citrina*) “Occurs in scattered clumps in the wetter part of the creek and surrounding areas. *Melaleuca citrina* generally occurs at the edge and further up the slope.”

Callistemon citrinus is a common and widespread species ranging from temperate eastern Victoria, along the NSW coast and ranges to subtropical southeast Queensland (Harden 1991; Wrigley and Fagg 1993; Spencer and Lumley 1991). It exhibits significant natural variation, in addition to which there are numerous cultivars and hybrids in cultivation (Wrigley and Fagg 1993). This species is sympatric with *C. purpurascens* and the evolutionary relationship between them is unknown. In this paper, reference to *C. citrinus* characteristics is to specimens that co-occur with *C. purpurascens*, rather than to the species across its substantial geographic range.

Callistemon citrinus and *C. purpurascens* are not as readily distinguished from each other by observation of the flower alone because decaying inflorescences of *C. purpurascens* can redden and resemble those of *C. citrinus*. Similarly, decaying flowers of *C. citrinus* can darken and come to resemble the purple flowers of *C. purpurascens*. The fresh flowers of these two species are distinctly different, even when the plants occur in close proximity. Fresh *C. citrinus* flowers are red (Fig. 3).

The fruits of *C. purpurascens* are significantly larger and more robust than those of *C. citrinus*. This is most evident in older fruits e.g. those retained after more than one year post-flowering.

The fruits of *C. purpurascens* are more globose and have a relatively narrower aperture for their size when compared to the more barrel-shaped, wider-aperture fruits of *C. citrinus*. This is the most reliable distinguishing characteristic between these two species (Figs 2, 4). In addition, the leaves of *C. purpurascens* are generally longer and wider than those of the local forms of *C. citrinus* (Fig. 3).

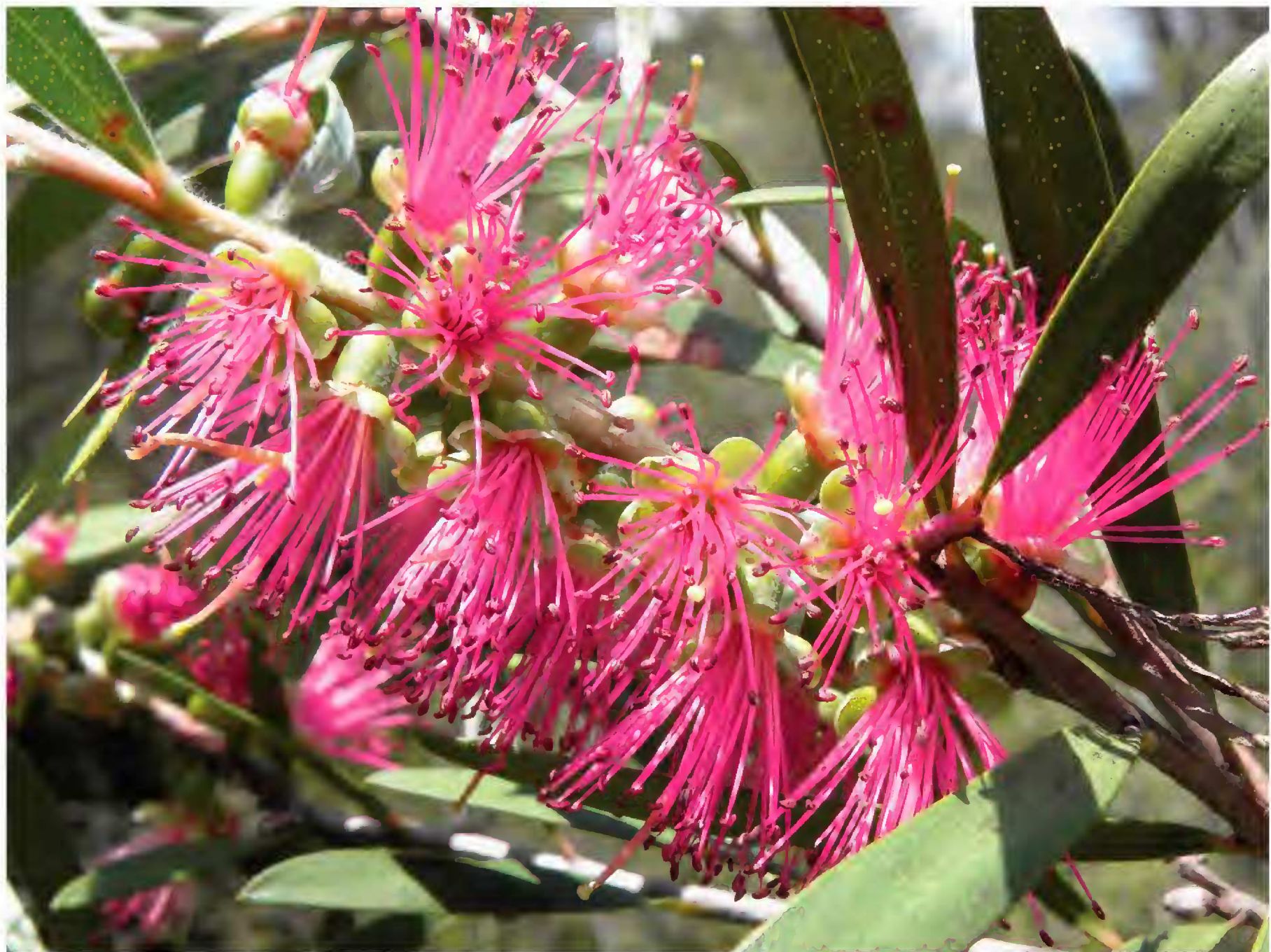


Fig. 1. *Callistemon purpurascens*, showing leaves and inflorescence, with pale green sepals, drying brown, and purplish stamens.

Callistemon purpurascens has only been observed in wet sites. *C. citrinus* occurs above the wettest part of the swampy riparian zone and floodplain, and can occur in drier, forested environments. Very mature *C. purpurascens* can grow to 7 m in their natural habitat, whereas nearby *C. citrinus* are generally 2–2.5 m high, though most specimens of *C. purpurascens* are approximately 2.5–3 m high.

A naked-eye comparison of specimens of the three *Callistemon* spp. described here and that occur in or adjoining each others' habitat will reveal that *C. megalongensis* has by far the lightest coloured inflorescence with the narrowest width relative to its length; the narrowest leaf; and the longest mucro (Fig. 3). *Callistemon purpurascens* has the darkest coloured inflorescence, which is often the widest; the longest and widest leaf; and by far the largest fruit (Figs 2, 4), with an overall more robust character than either of the other species.



Fig. 2 *Callistemon purpurascens*, showing mature fruits with characteristically narrow aperture relative to fruit diameter

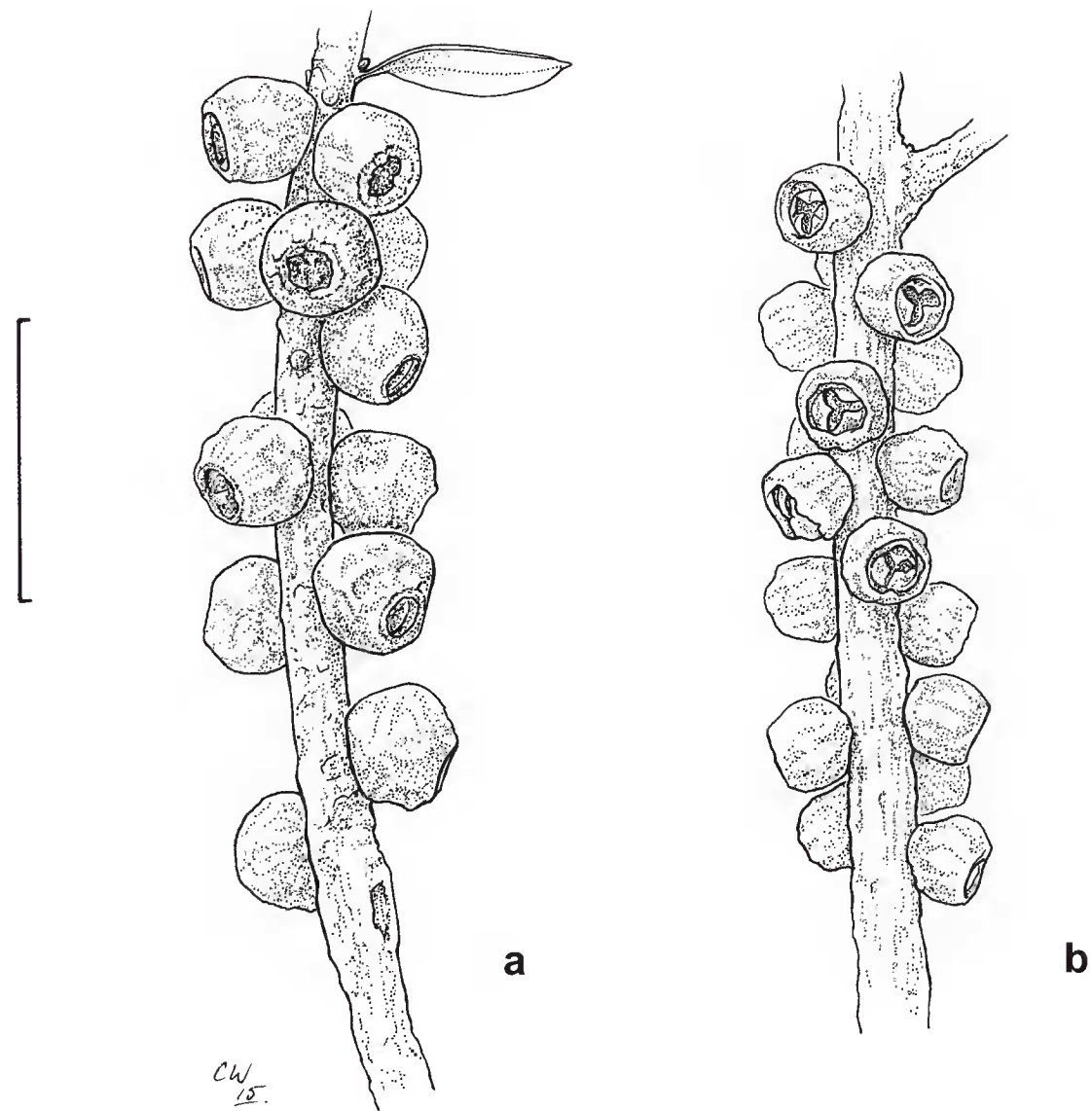


Fig. 3. Comparison of infructescences. **a**, *Callistemon purpurascens*; **b**, *Callistemon citrinus*. (**a** from S.M.Douglas & S.Robyn s.n., NSW907108; **b** from R.H.Cambage s.n., NSW553370). Scale bar = 2 cm.



Fig. 4. Comparison of inflorescences and leaves of *Callistemon* species. Specimen tagged 7 is *Callistemon megalongensis* with the narrowest inflorescence and narrowest leaves that are also the most pungent-pointed; specimen 17 is *C. citrinus* with wider inflorescence and wider leaves than *C. megalongensis*; specimen 13 is *C. purpurascens* with the widest and longest inflorescence and leaves.

Table 1 Comparison of some morphological characteristics of *Callistemon megalongensis*, *C. purpurascens* and *C. citrinus*.

Morphological Characters	<i>C. megalongensis</i>	<i>C. purpurascens</i>	<i>C. citrinus</i>
Height	Shrub to 5 metres (mostly <3 m), branching low	Shrub to 7 metres (mostly <3 m), mostly branching from 1.5 m	Stiff erect shrub to 1–3 metres, mostly branching low and with a more intricate form than <i>C. purpurascens</i>
Bark	Subpapery, medium soft, flaking or peeling	Platy and flaking to peeling (in small sections), subpapery on the largest stems and trunk(s)	Platy to furrowed on largest stems and trunk(s) of older specimens
Leaf dimensions	35–55 mm long, 3.5–5 mm wide	30–73 mm long, 5–11 mm wide	30–70 mm long, 5–10 mm wide
Leaf blade	Sericeous, glabrescent, narrowly elliptic to narrowly obovate Transversely linear, usually thickened at margin and midrib.	Both surfaces glabrous, oblanceolate Thickened at the margin and midrib. Lower surface with occasional silky brown hairs towards the petiole	Oblanceolate to lanceolate Leaf margin less thickened than <i>C. purpurascens</i> . Midvein slightly thickened.
Leaf base	Narrowly cuneate	Finely tapered, thickened and often twisted	Tapering, slightly twisted
Leaf apex	Narrowly acute to narrowly acuminate (prominent straight, pungent mucro)	Narrowly acute to narrowly acuminate with a mucro	Usually short acuminate and pungent with short mucro
Leaf veins	Primary veins pinnate, c. 15–24 on each side of the midrib	Obvious pinnate lateral venation, though generally less apparent than in <i>C. citrinus</i> due to thicker leaves.	Obvious on underside, but obscure to absent on upper surface
Leaf oil glands	Moderately dense, distributed throughout the lamina, distinct or obscure	Less dense and less prominent than in <i>C. citrinus</i> or <i>C. megalongensis</i> because of thickened lamina	Usually conspicuous
New foliage	Stems and leaves downy-hairy, hairs <3 mm and appressed on lower parts of leaves	Stems and leaves white downy-hairy, hairs <4 mm and dense, tending to appressed on lower half of leaves. Hairs present on leaf margins other than in mature leaves. Hairs persisting to previous season of woody growth. Petiole reddish and larger than in <i>C. citrinus</i>	Stems and leaves downy-hairy but not dense, hairs <3 mm, quickly becoming glabrous with age.
Inflorescence	25–60 monads, 70–80 mm long, 30–40 mm wide	20–60 monads, 60–120 mm long, 40–55 mm wide	26–40 monads, 40–75 mm long, 35–45 mm wide
Flower: hypanthium	Hairy, 3.3–3.5 mm deep	Tuberculate to warty-bullate. Downy hairy, 3.3–4 mm deep	Glandular-tuberculate. Downy, 3.5–5.5 mm deep
Flower: calyx	Abaxially glabrescent 1.7–2 mm. Scarious in a marginal band c. 0.5–0.7 mm wide, deciduous	Sparsely hairy (not glabrescent). Scarious with membranous bands; central band 0.1 mm wide, deciduous	Tends not to retain calyx lobes
Flower: filaments	Magenta pink, 9.5–14 mm long	Red Purple 72A (RHS Colour Chart, 1966 edition), 17–23 mm long	Bright red but darkening with age. Red 46A (RHS Colour Chart, 1966 edition), 13–16 mm long
Flower: anthers	Dark red	Dark purple to brown	Dark red to brown
Flower: style	17 to 19 mm long	18 to 23 mm long	16–18 mm long
Fruit	c. 6 mm diam.	c. 8–10 mm diam., slightly wrinkled, does not retain calyx lobes. Globose but may deform to barrel-shaped when crowded.	c. 4–7 mm diam. depressed globular with comparatively broad aperture
Seed	Cotyledons concavo-convex (Craven 2009)	Cotyledons obvolute	Cotyledons obvolute (Craven 2009)

Acknowledgments

The first author acknowledges the assistance of Ms Sylvia David with morphometric data collection and germination trials. Research into the ecology of *Callistemon megalongensis* and *C. purpurascens* has been jointly part-funded by NSW Office of Environment & Heritage, and Blue Mountains City Council. Council staff, Dave Melick, Matt Chambers, and Mike Henson have assisted with this research at various stages. Blue Mountains City Council part-funded the preparation of this paper for the purposes of supporting a nomination of *C. purpurascens* as a Critically Endangered species under State and Federal laws. The private landowners who permitted access to their properties are acknowledged for their support. Particular thanks go to Catherine Wardrop for preparing Figure 3.

References

- Craven LA (2009) *Melaleuca* (Myrtaceae) from Australia. *Novon* 19: 444–453 <http://dx.doi.org/10.3417/2007137>
- Douglas SM, and Robyn S (2006) Report on the conservation status and management requirements of *Melaleuca* sp. 'Megalong Valley'. Unpublished report to Blue Mountains City Council and NSW Department of Environment & Conservation. (Ecological Surveys & Planning: Chisholm, ACT)
- Douglas SM (2013) Report on the establishment of monitoring plots and survey for *Callistemon megalongensis* and *Callistemon* sp. nov. '*purpurascens*'. Unpublished report to Blue Mountains City Council and NSW Office of Environment & Heritage. (Ecological Surveys and Planning: Bundanoon, NSW)
- Wilson PG (1991) *Callistemon citrinus*: in Harden GJ (ed.) *Flora of New South Wales*, vol. 2, 2nd edition. (New South Wales University Press: Kensington)
- NSW Scientific Committee (2013) *Final Determination to list Callistemon megalongensis as a Critically Endangered Species*. <http://www.environment.nsw.gov.au/resources/threatenedspecies/CallimegaCRFD.pdf> (accessed 15 April 2015)
- Royal Horticulture Society (1966) *Colour Chart*. (RHS: London)
- Spencer RD, Lumley PF (1991) *Callistemon citrinus* (Curtis) Skeels. *New South Wales Flora Online*. <http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Callistemon~citrinus> (accessed 15 April 2015)
- Steffen W, Burbidge AA, Hughes L, Kitching R, Lindenmayer D, Musgrave W, Stafford Smith M, Werner PA (2009) *Australia's biodiversity and climate change*. (CSIRO Publishing: Canberra, ACT)
- Udovicic F, Spencer RD (2012) New combinations in *Callistemon* (Myrtaceae). *Muelleria* 30: 23–25
- Wrigley JW, Fagg M (1993) *Bottlebrushes, paperbarks and tea trees: and all other plants in the Leptospermum alliance*. (Angus & Robertson: Sydney, NSW)

Manuscript received 22 April 2015, accepted 2 September 2015